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The AMERICAN JOURNAL of OPTOMETRY

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AMERICAN JOURNAL OF OPTOMETRY

Vol. 15 APRIL, 1938 No. 4

CONTENTS

ORIGINAL PAPERS

The Effect of the Ametropic Distance Correction upon the Accommodation and Reading Addition. Julius Neumueller 120

Psychology and Diagnosis. Lewis H. Kraskin 129

Technique in Strabismus Orthoptics. William Smith 138

EDITORIAL

Secondary Deviation of the Visual Axis as the Primary Diagnostic Point between Paralylic Squint and Concomitant Squint. Carel C. Koch . . 150

SPECIAL REPORT

Osteopathy and the Eye. J. Martin Littlejohn 151

BOOK NOTICES

Neuro-Ophthalmology. R. Lindsay Rea 158

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Management and Circulation as required by the Act of Congress of August 24th, 1912, of the American Journal of Optometry, published monthly at Minneapolis, Minnesota, for April 1, 1938.

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(My commission expires May 19, 1943.) **Hennepin County, Minnesota**

1
Lorit protects four vital points
Where lenses break from strain.
2
A strap that's inconspicuous,
Screwless—engraved or plain.
3
Let's look inside this strap on which
Our sturdiness depends.
4

AMERICAN JOURNAL OF OPTOMETRY

Vol. 15 APRIL, 1938 No. 4

THE EFFECT OF THE AMETROPIC DISTANCE CORRECTION UPON THE ACCOMMODATION AND READING ADDITION*

Julius Neumueller, B.S., O.D., F.A.A.O.
Southbridge, Mass.

The November, 1936 issue of the American Journal of Optometry brought an article by Dr. James O. Baxter, Jr., and the January issue of 1937 carried a reprint of correspondence between Dr. E. Petry and Dr. Baxter with reference to this article. Dr. Petry rightfully contests some of the basic concepts used in Dr. Baxter's article referring to his article "Phorias," American Journal of Optometry, Volume 10—1933. While part of Dr. Petry's article of 1933 is contained in the problem presented by Dr. Baxter, it is diverging to another field in its ultimate aim. It may, therefore, not be amiss to present the specific question raised by Dr. Baxter and to try to provide the answer. In so doing we stress the point that this problem has long been recognized by the pioneers in ophthalmic optics such as Donders and Landolt.

The problem in its most general aspect may be stated as follows. It is to be found the addition (segment power S) for equal accommodation of equivalent presbyopes wearing different ametropic distance corrections at the usual distance from the apex of the cornea. From the general solution of this problem can be deducted immediately, as we shall demonstrate, the answers to all other questions which may arise.

We shall present the mathematical derivation with the assumption that the lenses are infinitely thin which does not vitally affect the final answer. The errors introduced by this assumption are less than the errors introduced by the obliquity of the near rays entering the segment regardless of its type. The reading matter be a distance "r" from the correction lens. All accommodation be assumed to take place in the anterior principal point of the eye. Any possible departure from these assumptions has no practical effect upon the solution. The distance from this primary principal point to the correction lens is considered fixed and taken as d = 15 mm. which conforms with the average position of spectacle lenses.

*An abridgment of the material presented before the American Academy of Optometry at Rochester, New York, June 24, 1937.

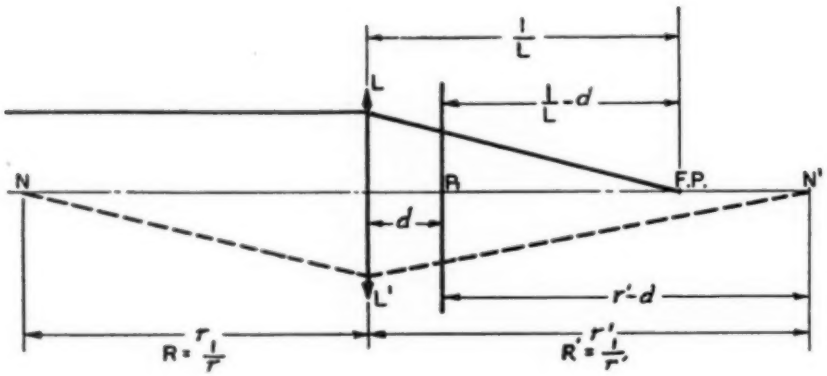


FIG. I

In Figure 1: Full lines show distance condition.
Dotted lines show near condition.
L distance correction lens.
L′ near correction lens.
S dioptric power of reading segment ($S = L' - L$).
P_1 primary principal plane of eye.
d distance from correction lens to P_1.
F.P. Far point of ametropic eye (also focus of distance correction lens).
N the near point object.
N′ its conjugate image in reference to near correction lens.
r and r′ object and image distance for the near object.

The definition for the accommodation is as follows. The accommodation has to compensate for the difference in vergence power of the distance and near rays as incident upon the eye. We may express this definition in a geometrical optical sense. The accommodation is the dioptric power which must be applied at P_1 to image the point N′ at the far point F.P.

Vergence of distant rays as incident upon eye $Vd = \dfrac{L}{1 - dL}$.

Vergence of near rays as incident upon eye $Vn = \dfrac{1}{r' - d}$

From equation — $\dfrac{1}{r} + \dfrac{1}{r'} = L' = L + S$;

$$\frac{1}{r'} = R' = L + S + R;\ (R = \frac{1}{r});\ r' = \frac{1}{L + S + R}$$

$$\text{Then } Vn = \frac{1}{r' - d} = \frac{L + S + R}{1 - d\ (L + S + R)}$$

$$\text{Accommodation } A = -\ (Vn - Vd) = Vd - Vn$$

$$A = \frac{L}{1 - dL} - \frac{L + S + R}{1 - d\ (L + S + R)}$$

As stated before we want to find the segment power for presbyopes applying the same accommodation but wearing different ametropic distance corrections. We therefore have to solve for S.

$$S = -R - A\,\frac{(1 - d\,L)^2}{1 - dA\ (1 - d\,L)};\ (I)$$

For the computation we take all optical distances measured in the direction of the emergent ray as plus. The distance (d) from the correction lens to the primary principal point is a positive quantity. The distance r from the lens to the near point target N is negative and taken as —400 mm., which gives for R = —2.50 dio. The distance lens power L is the dioptric value of the distance correction. For the computation of numerical values we took the accommodation as 0.00, 0.50, 1.00, 1.50, and 2.00 dio.

As an example we assume an accommodation of 1.00 dio. and a distance Rx of —5.00 dio.

Then A = +1.00 dio.; L = —5.00 dio.; d = 0.015 M; R = —2.50 dio.

$$S = +2.50 - 1.00\,\frac{(1 + 0.015 \times 5)^2}{1 - 0.015 \times 1\ (1 + 0.015 \times 5)} = 1.22 \text{ dio.}$$

The computation results are presented by the graphs and tables A.

Discussion of Formula I and Graph A

$$S = -R - A\,\frac{(1 - d\,L)^2}{1 - d\,A\ (1 - d\,L)}$$

We see immediately that the only cause for discrepancy of segment powers for ametropic presbyopes with equal accommodation is the factor d, the distance from correction lens to principal plane of eye. If we could apply the correction lens at the principal plane of the eye thus making

the distance d = O, the influence of the distance correction L would be eliminated and the formula would become: S = —R —A.

If there is no accommodation at all (A = O) as in advanced presbyopia, the segment power equals the reading distance (distance from lens to near object) expressed in diopters.

S = —R (for A = O)

S = +2.50 D (alike for hyperopia and myopia).

We also see from the diagrams that the hyperopic presbyope needs a higher addition than a lesser hyperopic or myopic presbyope. The highly myopic presbyope still being able to bring up 1.75 or 2.00 dio. of accommodation does not need any addition to help him in his reading. In other words the myope becomes presbyopic, for purely optical reasons, at a later date in his life than the equivalent hyperope. We shall expand on this point later.

The simplified form of the formula (I) will bring out these points more vividly. The simplification shall exist in omitting all members of the equation containing expressions of d (0.015 M) of second and higher order.

$$S = -R - A\,\frac{(1 - dL)^2}{1 - dA\,(1 - dL)} = -R - A\,\frac{1 - 2dL}{1 - dA}$$

$$S = -R - A\,(1 - 2dL)\,(1 + dA) = -R - A - dA^2 + 2dAL$$

$$S = -R - A\,(1 + dA) + 2dAL \quad (II)$$

For a given accommodation the expression

$$-R - A\,(1 + dA) = C_1 \text{ (a constant)}$$

and $2dA = C_2$ (a constant and always positive)

then $S = C_1 + C_2 L$

It is then immediately obvious that the segment power (addition) decreases when L and thus C_2L becomes minus (myope) and increases when L and C_2L becomes plus (hyperope).

A computation with this approximate formula II will show that its results would be amply exact enough for practical purposes. Assuming a case of A = +2.00 dio., R = —2.00 dio., d = 0.015 M and L = +10.00 dio. and —10.00 dio. respectively, we would get

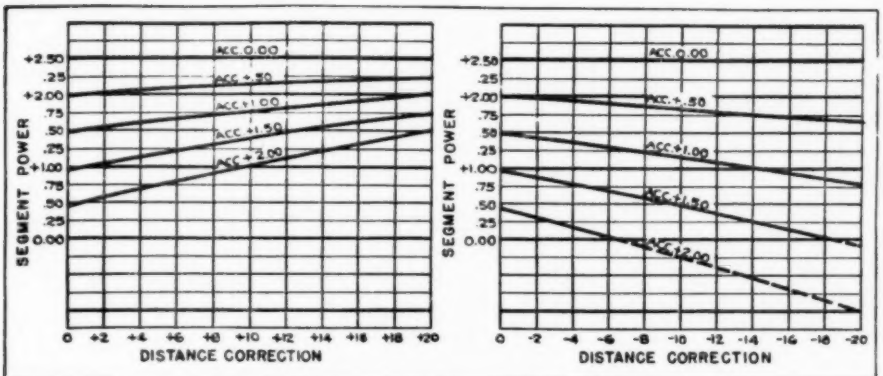
For L = +10 dio.: S = +2.50 —2 (1 + 0.03) + 0.06 L

= 0.44 + 0.60 = 1.04 dio.

For L = —10 dio.: S = 0.44 — 0.60 = —0.16 dio.

The exact values from Table A are 1.02 dio. and —0.24 dio. respectively.

Again we repeat that it is quite useless to consider the thickness of bifocal lenses for our calculation, because looking through the segment



DISTANCE CORRECTION HYPEROPIA	SEGMENT POWER ACC. +2.00 DIO.	ACC. +1.50 DIO.	ACC. +1.00 DIO.	ACC. +0.50 DIO.	ACC. 0.00 DIO.
0.00	0.44	0.96	1.48	1.99	2.50
+1.00	0.50	1.01	1.52	2.01	2.50
+2.00	0.56	1.04	1.55	2.03	2.50
+3.00	0.62	1.09	1.58	2.04	2.50
+4.00	0.68	1.14	1.61	2.06	2.50
+5.00	0.74	1.19	1.64	2.07	2.50
+6.00	0.80	1.23	1.66	2.09	2.50
+7.00	0.85	1.27	1.69	2.10	2.50
+8.00	0.91	1.31	1.72	2.11	2.50
+9.00	0.96	1.35	1.75	2.12	2.50
+10.00	1.02	1.39	1.78	2.14	2.50
+11.00	1.07	1 43	1.81	2.15	2.50
+12.00	1.12	1.47	1.83	2.16	2 50
+13.00	1.17	1.51	1.86	2.17	2.50
+14.00	1.22	1.55	1 88	2.19	2.50
+15.00	1.27	1.54	1.90	2.20	2.50
+16.00	1.32	1.62	1.92	2.21	2.50
+17.00	1.36	1.66	1.94	2.22	2.50
+18.00	1.41	1.69	1.96	2.23	2.50
+19.00	1 45	1.72	1.98	2.24	2 50
+20.00	1.50	1.75	2 00	2.25	2 50

DISTANCE CORRECTION MYOPIA	SEGMENT POWER ACC. +2.00 DIO.	ACC. +1.50 DIO.	ACC. +1.00 DIO.	ACC. +0.50 DIO.	ACC. 0.00 DIO.
0.00	0.44	0.96	1.48	1.99	2.50
−1.00	0.38	0.92	1 45	1 98	2.50
−2.00	0.32	0.87	1.42	1 97	2.50
−3.00	0.26	0.83	1.39	1.96	2.50
−4.00	0.19	0.78	1.36	1 94	2.50
−5.00	0.13	0.73	1 32	1.93	2.50
−6.00	0.06	0.68	1.29	1 91	2.50
−7.00		0.63	1.25	1 90	2.50
−8.00		0 58	1.22	1 88	2.50
−9.00		0.53	1 19	1 86	2.50
−10 00		0.48	1 15	1 84	2 50
−11.00		0.43	1 12	1 82	2.50
−12.00		0.37	1.09	1 80	2.50
−13.00		0.32	1 05	1 78	2 50
−14.00		0.26	1 01	1.76	2 50
−15.00		0.20	0.97	1 74	2.50
−16.00		0.14	0 93	1 72	2 50
−17.00		0.08	0 90	1 71	2.50
−18.00		0.02	0.86	1.69	2.50
−19.00			0 82	1 67	2 50
−20.00			0.78	1.65	2.50

SEGMENT POWER FOR DISTANCE CORRECTED AMETROPIC
PRESBYOPES WITH GIVEN ACCOMMODATION FOR READING AT 16"

J.F NEUMUELLER — GRAPH AND TABLE A — BUREAU OF VISUAL SCIENCE AMERICAN OPTICAL Co

obliquely introduces spherical and astigmatic aberrations of magnitude greater than the error introduced by our assumption of infinitely thin lenses. This holds true for all present types of bifocals.

Influence of the Distance Correction Upon the Acommodation of Non-presbyopes

The problem is to determine if and to what extent the distance corrected hyperope or myope has to accommodate more for near work. This then immediately raises the problem to determine which one of the groups, for purely optical reasons, demands reading additions at an earlier age. Again the problem is first solved paraxially for a fixed near point (400 MM = —2.50 dio.), a fixed position of the correction lens before the eye (d = 0.015 M distance from lens to primary principal point) and infinitely thin lenses.

A non presbyope wears single vision lenses and thus has no segment power (addition) in his correction. Therefore S in equation (I) is = O.

$$\text{Then } O = -R - A\,\frac{(1 - d\,L)^2}{1 - d\,A(1 - d\,L)}$$

$$\text{Solving for } A = \frac{R}{(1 - d\,L)\,[d\,R - (1 - d\,L)]}$$

Simplifying this equation by omitting members containing d in the second or higher order we finally arrive at

$$A = -R\,(1 + d\,R) - 2\,d\,R\,L \quad \text{(IV)}$$

For: R = —2.50 dio., d = 0.015 M

$$A = 2.36 + 0.075\,L \quad \text{(IVa)}$$

Consideration of IVa shows that an increase of one diopter in plus distance correction adds about 0.08 dio. more to the accommodation for near, while an addition of one diopter in the minus distance correction reduces the accommodative effort by about 0.08 dio. The hyperope needs more and the myope needs less near point accommodation.

For the actual calculation of accommodation of corrected ametropic non-presbyopes the author did not use the formula as developed for infinitely thin lenses but determined the presented data by paraxial geometric ray tracing through conventional thick lenses. The smoothed out values are shown in table and graph B. The reason for calculating these values for conventional thick correction lenses is that the non-presbyope can and usually does use the paraxial area of his lens for near work while the bifocal wearer has to look obliquely through the segment when reading.

It is then apparent that under otherwise equal conditions the accommodation induced by high plus corrections applied 15 mms. in front of

P. forces hyperopes to accept bifocal additions at an earlier age than emmetropes or myopes. It is generally assumed that for sustained near point work only one-half of the total accommodation should be used. Working on the basis of this assumption, however, would give irrelevant data as to the age at which these ametropes would ask for bifocal assistance. For instance, under this rule a +16.00 dio. hyperope in order to accommodate +5.00 dio. for 16″ would become presbyopic at the age of 20 because at this age his amplitude of 10 dio. is twice the demand of 5 dio. From clinical and practical experience we know that the average patient is ready to accept bifocals when he has only an accommodative reserve of +1.25 dio. beyond the demanded accommodation of +2.50 for reading. To find thus the probable presbyopic age limit for a given corrected ametrope we subtract 1.25 D. from Donder's accommodation values and enter these data in graph B which shows the accommodation for non-presbyopia ametropes.

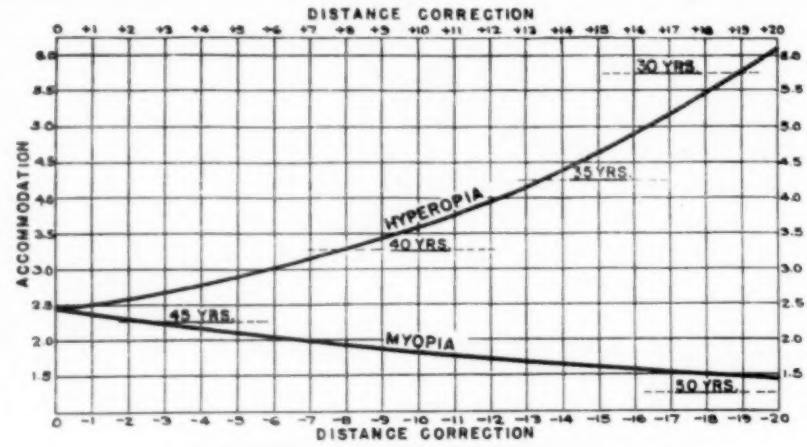
DONDER'S AMPLITUDE TABLE

Age in Years	Acc. in Diopters	Acc. in Reserve	Acc. for Use
30	7.00	1.25	5.75
35	5.50	1.25	4.25
40	4.50	1.25	3.25
45	3.50	1.25	2.25
50	2.50	1.25	1.25

These data present, of course, only relative comparison values and these considerations simply tell us that a medium or high hyperope will become presbyopic, for purely optical reason, 4 or 5 years earlier than an emmetrope or myope.

From the graph B it is evident that in cases of high anisometropia, we find for near work a measurable difference of accommodation between the two eyes. This in turn will frequently lead to a difference in additions for anisometropic presbyopes demanding a higher addition for the higher hyperopic or less myopic eye.

Of course, aphakic cases do not come under the classification of non-presbyopic hyperopes but are completely presbyopic hyperopes. There the accommodation is zero and from Graph A we see that theoretically their additions should be +2.50 dio. Clinically the aphakic eye is usually given a higher addition than the theoretical value of +2.50 dio. because it is frequently physiologically a poorly functioning organ and the absence of the crystalline lens may change its optical system in such a way as to bring about a shift of the circle of least confusion from its normal position. In unilateral aphakia, we find fusion difficulties, not on account of the strong addition, but on account of the inequality of the retinal images.


DISTANCE CORRECTION
0 +1 +2 +3 +4 +5 +6 +7 +8 +9 +10 +11 +12 +13 +14 +15 +16 +17 +18 +19 +20
ACCOMMODATION
30 YRS.
35 YRS.
HYPEROPIA
40 YRS.
45 YRS.
MYOPIA
50 YRS.
0 -1 -2 -3 -4 -5 -6 -7 -8 -9 -10 -11 -12 -13 -14 -15 -16 -17 -18 -19 -20
DISTANCE CORRECTION

HYPEROPES		MYOPES	
Ve	ACC.	Ve	ACC.
0.00	2.45	0.00	2.45
+1.00	2.52	−1 00	2 37
+2.00	2 60	−2.00	2 30
+3 00	2 69	−3.00	2 23
+4.00	2 80	−4.00	2 16
+5.00	2 90	−5.00	2 10
+6 00	3.04	−6 00	2 04
+7.00	3 17	−7 00	1.98
+8.00	3 30	−8.00	1 93
+9 00	3 44	−9.00	1 88
+10 00	3 54	−10 00	1 83
+11.00	3 76	−11 00	1.78
+12 00	3 94	−12 00	1.74
+13.00	4 16	−13.00	1.70
+14.00	4.39	−14.00	1 66
+15.00	4 54	−15.00	1.62
+16.00	4 90	−16.00	1.58
+17.00	5.17	−17 00	1.54
+18.00	5 45	−18.00	1.50
+19.00	5.75	−19.00	1.46
+20.00	6 07	−20.00	1 43

Ve EFFECTIVE VERTEX POWER

ACCOMMODATION FOR CORRECTED NONPRESBYOPIC AMETROPE FOR 16" READING DISTANCE.
RELATIVE APPROXIMATE AGE FOR BEGINNING OF PRESBYOPIA.

GRAPH AND TABLE B

J.F NEUMUELLER

BUREAU OF VISUAL SCIENCE
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Change of Cylinder Induced by Unequal Accommodation

Let us consider the following distance prescription for a non-presbyope:

R 0.00
L —4.00 axis 180°

Reading with these classes at 16″ asks for an accommodation of +2.50 dio. in the right eye and for an accommodation of +2.50 dio. in the 180° meridian and 2.16 dio. in the 90° meridian of the left eye.

To equalize the accommodative effort between the eyes and the principal axis of each eye, we would theoretically have to increase the cylindrical power of the correction when used for near by about 0.34 dio. The near corrections would then be

R = 0.00
L = —4.34 axis 180°

Similarly a distance correction of

R = 0.00
L = +4.00 axis 180°

when used for near would ask for an accommodation of +2.50 dio. in the right eye and for an accommodation of +2.50 dio. in the 180° and +2.80 dio. in the 90° of the left eye. In order to equalize the accommodation in this case, we would have to increase the cylindrical power of the correction when used for near by about 0.30 dio. Thus the near correction would read

R = 0.00
L = +4.30 axis 180°

Summary

The position of the correction lens being 15 mms. in front of the primary principal point of the eye influences the accommodation for near. On account of this accommodative influence we find that under equal conditions presbyopic hyperopes ask for higher reading additions than those for presbyopic myopes.

Presbyopic anisometropes, depending upon the degree of anisometropia, need a different reading addition for each eye.

Hyperopes accept bifocals at an earlier age than myopes.

In extreme cases of astigmatism different distance and near astigmatic corrections are to be considered.

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PSYCHOLOGY AND DIAGNOSIS*

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"Anguish of mind has driven thousands to suicide; anguish of body, none. This proves that the health of the mind is of far more consequence to our happiness than the health of the body, although both are deserving of much more attention than either receives."—Colton.

Diagnosis of human ills is a complex procedure. Its complexity is augmented in accordance with advanced knowledge gleaned from the respective sciences upon which the practice of the healing art in all its phases depends.

Fifty years ago, diagnosis by the aid of instruments was very inadequate. The doctor had but few instruments of precision at his command, such as the thermometer, the microscope, the stethoscope, etc. Laboratory analysis did not furnish him with the knowledge as today, for applied chemistry and bacteriology were of a very simple nature.

The field of pharmacology was largely a region of guess work. There was very little experimental knowledge of the effect of drugs upon the body or the determination of medicinal potions upon the physiology of any of the internal organs. That was the state of pharmaceutical knowledge when Dr. Holmes aptly applied the satirical sentence, uttered as a credo in a lecture before the Harvard Medical School. He said, "I firmly believe that if the whole materia medica could be sunk to the bottom of the sea it would be all the better for mankind and all the worse for fishes."

The older doctors served their communities skillfully and well because they knew their people. Of course, they missed certain diagnosis, which today with more knowledge and better equipment are obvious. Abler in some respects than their modern brethren, they studied, along with disease, hereditary peculiarities, the psychology of their patients, as the result of their long experience as family physician. That was possible as social life was more or less "fixed." The small community was the norm, and the family physician the general practitioner, the rule. Very often the same physician rendered services to several generations

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in succession. That usually cemented a firm personal trust in the physician's ability even if his scientific knowledge was meager. But with the emergence of industrialism, shifting populations from center to center, the growth of large communities, the old relationship between doctor and patient has undergone a change. Also the progress of the sciences, the new developments in technological equipment has been nothing short of a miracle. The general practitioner finds it now more and more difficult to keep abreast with all the latest developments of medicine and in order to fit himself adequately for service he tends to limit himself to a special field. Thus, we notice the tendency to specialization which has become necessitated by the constantly growing and expanding knowledge of the homo genus in health and disease.

By virtue of mechanical progress, technical devices play the dominant role in diagnostic procedure with a minimum consideration of the psychological element. The doctor marshalls all the scientific gods to his aid from laboratories and specialists: X-ray, radium and its uses, various instruments as the ophthalmoscope, otoscope, bronchoscope, cystoscope, the electrocardiograph, etc. Also the new knowledge that chemistry has furnished on metabolism, functions of the liver and kidneys, fields which were very vague until recently, and the new bacteriology with its epoch-making discoveries in the fields of serology and an understanding of the process of immunity and the development of various blood tests as the Widal reaction in typhoid fever, the Wasserman reaction in syphilis, and numerous other tests as the dermiographic test, Kottman's test, the Fauser-Abderhalden test, etc.

Space does not permit me to enter into a detailed account to contrast the healing art of the recent past with the present in knowledge and technique, but I merely wish to indicate the tremendous advance in our knowledge of disease and the elaborate technical aids at the doctor's disposal. Yet the writer contends that these purely objective, mechanical measures of approach toward an understanding of symptomatology, functional disturbances, in short, an understanding of "disease" used in the widest connotation of the term are inadequate, for men in health as well as in disease is a unitary being and cannot be reduced to individual organs. The malfunction of an organ cannot be corrected or abnormality eliminated by limiting the therapeutic measure to the respective organ alone. Man being an inter-related organism of a series of psycho-biological functions, the doctor has to contend with the totality of his equipment, his heredity, early moulding influences of his environment, sets of emotional responses, in short, his personality, if a correct diagnosis and hence prognosis is the desiratum. Various authorities have presented figures which show that as high as 40 per cent of all patients going to doctors to be healed of some disease are in reality suffering from some form of psychic abnormality. It is a reasonably sound position, which doctors take, that they must look always for the physical basis of disease, but therein lies a pitfall. If after a critical and

careful examination, all organs are found to be intact and working at par, we need not assume that the investigation has failed, but we must study along with our study of mal-functioning organs, the psychological sources of illness.

Our newer knowledge of man is emphasizing the role of instinctive drives—emotional reactions. Emotions are vital forces in preserving the individual from annihilation upon the scene of terrestrial life. These forces are as old as the race, for their activities are in the interest of race preservation. Man cannot escape them or ignore their urge without paying the price of illness.

In healthful living the emotional nature of man is more or less organized in definite habitual responses, quite unconscious in their activities. In illness, on the other hand, the emotional equipment tends to deviate, becomes more or less disorganized and the individual is out of sorts with himself and the environment, hence, we find that in periods of emotional stress and social difficulties, an individual may become ill with symptoms, pains and discomforts of all sorts. It is well known among psychotherapists that mental conflict, emotional reaction, if hindered from direct and immediate expression, manifest themselves in a host of physical symptoms, which are mistaken by the average doctor as symptoms of a physical disease, whereas, these ought to be understood as signs of emotional stress and personality mal-adjustment. Thus, a cystoscopic examination, e.q., may not reveal any sediment or lesion in the bladder and yet the patient experience pain in that organ accompained by frequent urination. Other patients may complain of headaches, pain and discomfort in the eyes, severe pain in the abdomen, the rectum, in the breast, in the back, and pain most anywhere, and all this in the absence of organic disease.

Most of us are familiar to some degree of the powerful effect that the emotion of fear exercises. No mortal can escape this "tyrant" fully. Most of man's woe is due to this titanic force. In health, it is kept under rational or habitual control to some extent, but in disease it breaks through, so to speak, and asserts itself. Every doctor is familiar with patients who are suffering from minor ailments and yet are panic-stricken as a result of their emotional attitude toward themselves, a state of affairs that definitely interferes with the curative processes of the individual. The central motive for these reactions seems to be the fright of ego-annihilation.

Very few individuals, regardless of their rational outlook upon life and their intellectual training can view themselves objectively in times when their own health is endangered. Schopenhauser, despite his philosophic pessimism, was so afraid of death that in his last years he would consult his physician weekly. However, among the great minds we can also find illustrious examples of bravery in the face of a deadly disease.

In his autobiography, Sigmund Freud records an interesting incident of his experience with the late American philosopher, William James. These two great men were on a walk together when William James was seized by an attack of angina pectoris. That happened in 1908 when upon the invitation of G. Stanley Hall, the eminent Viennese psychologist, came to lecture at Clark University. Of this experience Freud writes as follows: "He stopped suddenly, handed me a bag he was carrying and asked me to walk on, saying that he would catch up with me as soon as he had recovered from the attack, which was just coming on. He died of that disease a year later and I have always wished that I might be as fearless as he was in the face of approaching death."

Fear, hunger, or other powerful emotions do not only express themselves in a vague feeling that affects a person's mental outlook concerning life but emotions are peculiarly related to physiology and cause a change in bodily secretions, that results in changed body-chemistry and behavior. Pavlov and Cannon have supplied us with numerous experiments in which they demonstrated these "changes" occurring within the organism as a result of violent emotion. Dr. T. A. Ross, an English physician and authority on functional diseases, remarks concerning fear, in the following manner: "Fear is known to be followed by tremor of the limbs, which may be so great that the legs may give way, and the individual fall to the ground; profuse sweating may take place. More commonly in children than in adults, urine and feces may be voided involuntarily in the presence of fear. It is commonplace that anxiety may cause drying up of the saliva, so that the tongue cleaves to the roof of the mouth, that it may make the appetite disappear, and cause indigestion." The effects of emotional disturbances and the influences of psychological processes on body functions are of utmost importance in the field of internal medicine as every clinician with a large practice will admit. In the light of honest confession it is also conceded that many an operation could have been prevented or avoided if a psychological examination was thoroughly made and understood. A famous surgeon, e.q., examined a young married woman who complained of dyspareunia. The examination disclosed the uterus to be somewhat displaced downwards. The surgeon acted in accord with this diagnosis and proceeded to rectify same by surgery. However, she was no better for this; her discomfort and pain did not cease. Upon a psychological examination a different causal factor came into focus, namely, fear; that is, she had become afraid of her husband, for she was obsessed with the belief that her husband had recently acquired a venereal disease. Hence, we can see why the operation failed to attain the desired end. But treatment from the psychological viewpoint cured her and she had remained well ever since.

A friend of mine while studying at a theological seminary was under constant fear of food poisoning as the food of the school failed to come up to what he had been accustomed previously, and furthermore, he was abnormally interested in proper nutrition. For some time he felt

ill and a famous surgeon, after a very careful physical examination advised an operation for appendicitis. Fortunately, the school physician, who knew him well and had a better understanding of his symptoms, traced it to the patient's emotional reaction to his surroundings, and the over emphasis on the food was the patient's mental attitude to his difficult situation. With this knowledge brought to the patient's consciousness, he was helped to make a readjustment and the symptoms immediately disappeared.

Thus the task of diagnosis is not only to determine the nature of the disease but also to discern and understand the "person" who complains of the discomfort, the intricate human being who presents all sorts of symptoms and pains, for living conditions today are highly complicated and adjustment to them is a great task in which many fail. Ours is a neurotic age with Satanic ambitions for success, very often resulting in disastrous effects on the psycho-instinctual equipment of man's nature. Abnormal living, difficulties in personal adaptation, anxiety and fear are meaningful in diagnostic procedure. Hence, it follows that the total biography of the personality as it behaves in health and disease ought to be studied in order that we may obtain a rational understanding of the chain of the intricate relationship that exists between the normal and abnormal.

Case A. Mr. Smith was finally persuaded to come to the doctor's office for a "thorough" examination. According to his complaint his whole trouble centered in his stomach: nausea, pain, a gnawing sensation and intestinal cramps. His physician used his knowledge of scientific nutrition and availed himself of all the modern laboratory tests, and x-rays were taken. However, a complete and painstaking examination did not reveal any physical condition that could account for his symptoms.

The patient grew apprehensive of his ailment. Was he without any justification? He was thoroughly examined, to be certain, and yet nothing could be found to help him in his distress. But the psychological study of the patient, supplementing the physical examination, pointed to a solution. It revealed that Mr. Smith's digestive disturbance was not due to any physical basis of disease but had been conditioned by a spastic colitis due to phychic-disturbance—anxiety. This condition is typical of a large group of business men, whose life is deeply steeped in business matters and who take their duties with a sensitiveness and seriousness amounting to anxiety. With the proper psychological treatments all of his symptoms disappeared.

Case B. Patient, age 34, came to me for an eye examination. For many months she has had her sister read to her. Her vision is very bad, she assured me, and was certain she was getting cataract in one eye. She spent considerable time every day before the mirror observing the formation of the "white spot" in the pupil of one of her eyes, as she expressed it.

A thorough physical examination by a competent internist was negative and the optometric examination was negative except for a slight error of refraction that could be easily corrected with the proper glasses.

How then can we explain this condition that has thrust this patient into a panic, believing that she was becoming blind in one eye, and avoid the re-occurrence of the same?

The answer became discernible by taking a careful history and by an understanding of the psychologically formative process that has produced the ocular symptoms. The experiences of her adolescence showed that during that period she would wait very often on her grandmother who was blind and confined to bed. The girl would read to her invalid grandmother for she felt terribly sorry and was "touched" with "grandma's" affliction. Thus, when she too began to experience eye-difficulties, of a slight nature, physically, to be certain, her emotional reaction was conditioned by an unconscious fear, the fear that she too was getting blind as her "grandma" was. Her difficulties entirely ceased with her understanding the emotional component of her eye discomfort.

Case C. Man 39, suffering from asthenopia, had visited a number of the best eye specialists in his city. His glasses were changed frequently. Every time he received a new pair of glasses he felt comfortable for a short period, and then the old difficulty at close work would return. He would then visit another doctor with the hope of finding permanent relief. It is of interest to note that the different pairs of glasses that were prescribed differed very slightly either in focus or axis. A very careful optometric examination showed that there was nothing from an eye stand-point that should cause the symptoms he complained of. He should have been comfortable with any of the glasses he already had. His accommodative and convergent relationship was all that could be looked for.

A careful study of his history led me to see a different aspect of this man's complaint. I discovered that his eye discomfort emerged at a time of mental strain, a period when the patient hated his work and "did not want to see." Tracing much of the eye difficulties to his personal mal-adjustment the patient gained insight into his symptoms and was helped to attain the proper balance. His symptoms disappeared entirely and he has been comfortable to date.

Case E. Mrs. Z. a woman in the late middle age, has enjoyed a most satisfactory life of good health and a happy family of four children. She was a constant help to her husband in business and worked as many hours as he did in their store.

About two years ago her husband died after a short illness. To all evidence, it seemed she accepted the blow of fate bravely and was as ever absorbed with her family and business responsibilities.

Some months after this, she began to feel that something was the

matter with her. In the morning upon awakening she would feel dizzy and weak in her knees. Her head would ache, shoulders tense with feeling of heaviness in the center of the eyes, at times accompanied with blurred vision.

At the beginnig she did not pay much attention to these symptoms hoping that they were transitory and would soon pass. But an occurrence of fainting while at work made her seek a physician's help. After the examination the physician told Mrs. Z. that she was suffering from functional high blood pressure, and recommended rest, a vacation in the country and prescribed a tonic and other medicine to be taken after each meal, etc.

The patient followed the physician's advice faithfully and was feeling better. A relapse, however, came after four months and all the symptoms reappeared. Because of the eye symptoms she came to see me and after a very careful examination, I could not find enough wrong with her eyes to warrant any attention but her history suggested a psychological problem and I recommended her to another physician, a man with a deeper understanding of human ills. Again a thorough physical examination was negative, but a psychological examination revealed the reason for her illness. He therefore did not prescribe any medicine but simply explained to her the causes of her illness—its meaning in the absence of organic lesion, that the emotional trauma (of an unconscious nature) of her husband's death, the loss, heavy burdens of business and family responsibilities, unnerved her and frightened her into illness, and that she could become well again only through finding zest in life.

Mrs. Z. was surprised that worry or sadness could produce her illness for she was certain that she was afflicted with some grave disease. However, the authority of the physician convinced her of his insight into her emotional constitution and having gained faith in life through his guidance she became well and attended to her daily tasks courageously. A year has passed since then without a relapse.

From the foregoing we arrive at the following conclusion:

We have developed numerous laboratory procedures and physical apparatus which enable us to determine the functions of the eyes, ears, liver, kidneys, heart, lungs, and gastrointestinal tract. In studying an organ, such as the kidney, which produces a definite product, we find that an analysis of the product generally furnished quite definite information as to its function. Employing similar methods in the study of brain function, we analyze its products, which include alterations in human conduct, and thereby obtain definite information as to its function. Considering only the study of the products of the organs, we find the process relatively simple; however, when we study the factors operating to produce the product, our problem often becomes quite complex. The factors governing the function of many of the body organs may be easily understood, while those governing the psychic functions of the

brain are numerous and the mechanism is involved and complex. The term mind has been used extensively in the past, but with its usage it has become identified as the product only of the brain, and therefore, we have been considering the brain as a single organ responsible for the production and existence of the mind. Some authors have used the term personality interchangeably with the term mind. While the term personality is more inclusive and, therefore, more desirable, there are objections to its use. It has become almost universally used, by the public, to express the "front" or the exterior one presents to his associates. Defining personality as "that which constitutes, distinguishes and characterizes a person," we find the term sufficiently inclusive and adequate to express the potentiality which is the result of the interaction of the factors we have discussed.

Personality represents the sum total of all one has with which to meet the problems of life; it includes height, weight, sex, education, halitosis, dandruff, the emotions, and all those qualities which make for success or failure of the individual.

The absolute goal of all human beings is to satisfactorily meet their environment. The means employed and the end gained in achieving such satisfaction, vary with each individual.

In the primitive races, the task of meeting the environment is less complex, or more direct, the struggle being essentially limited to the meeting of their physical environment. In contrast to this, the civilization in which we live presents an ever increasing complexity; therefore, in conforming to the plans and specifications of modern civilization, man is plunged into an extremely complicated system which taxes his ingenuity and resources to the limit. He is not only confronted by the problems of his physical environment, but also must meet innumerable situations arising from his business, social, educational, moral, and political environment.

It is a well-established fact that we become aware of our physical environment through our central nervous system, including the brain, special senses and spinal nerves; and also, our response to the environment depends on the presence of these organs. These facts have been repeatedly demonstrated by animal experimentation and through the studies of humans born with deficiencies of the central nervous system. With these fundamental observations in mind, the earlier psychologists conceived the idea that all human response depended on brain structure and function. They, therefore, conducted extensive detailed studies of the brain, using delicate technic and special stains in their attempt to find the organic brain changes which they assumed must occur in patients having abnormal psychology. This method of study furnished information concerning abnormal psychology accompanying the organic diseases such as syphilis, brain tumors, arteriosclerosis, and so forth, but failed to develop a satisfactory method to demonstrate memories, acquired

characteristics, and intellect. They assumed that the conduct of the individual depended solely upon the brain. We do not accept this idea, but, instead, believe that the function of the other organs of the body, together with the central nervous system, yields normal or abnormal response. The human being is seldom confronted by the response to a single simple stimulus, but instead, is required to meet complex, multiple stimuli in the form of situations. The human may (1) flee from the situation; (2) attack the situation; (3) suffer a breakdown of his personality. This may take the form of a personal attack on his personality, or even suicide.

Therefore our motto must be prevention vs. cure. The men in all branches of the healing professions are in an opportune position to discern the onset of a malady by a skillful combination of the technological and psychological means in diagnosis. The location of pain, the particular organ that is assumed to be disfunctioning should be studied not as an individual separate entity but as related to the totality, the person. Above all, it is necessary to be, not only sympathetic with a patient but it is of greater significance for the doctor to eliminate fear and instill faith in the patient, to bring to him an appreciation and knowledge into the workings of his own personality.

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TECHNIQUE IN STRABISMUS ORTHOPTICS*

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Orthoptic procedure, like the procedure in ocular refraction, is based upon definite scientifically established facts. Optics, physiology and psychology are the underlying sciences in both. In orthoptics, however, the two latter are the principal basic sciences. Physiology of the neural mechanism and of the muscles, particularly those related to the visual apparatus, is a factor with which the orthoptist is concerned. Psychology of the visual perception faculty in its fullest form, is the underlying principle for the various training procedures in orthoptics. Thorough familiarity with all the three factors is imperative, if an optometrist aspires to be a successful orthoptist. Thorough understanding of the patient and the ability to impart and instill confidence in him, is extremely valuable.

To understand the basic principles of orthoptics and the scope of this work, one must have a definite understanding of the meaning of orthoptics. Briefly, orthoptics may be defined "a psychologically sound system of eye training. It deals with the correction and the re-education of faulty visual habits." The orthoptic procedure for the correction of strabismus, which I am about to outline, is based indirectly on Professor Pavlov's discovery of the conditioned reflex. Added to this, the newer discoveries in muscle and neural physiology, and psychology of habit training, attention, and visual perception in general, constitute the foundation upon which this technique is based. This applies to heterophorias, as well as strabismus. Essentially, both conditions are brought about by some abnormal development of the visual brain centers, causing, in turn, faulty development of the binocular co-ordination faculty. In one type of condition, there is an inhibitory force that is responsible for the co-ordination such as exists. In the other type of cases, this inhibitory force is lacking, either congenitally or through some form of arrested development, and there is an actual deviation. Briefly, Professor Pavlov discovered that certain of our functions are acquired or rather, learned after birth. True, there appears to be an innate tendency to all of our animal functions, but some of these are conditioned or developed

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functions, or, as Professor Pavlov termed them: "Conditioned reflexes." Vision is considered a conditioned reflex. The child is born with a visual perception apparatus. The eyes are inherently attuned to receive light stimulation, being outgrowths of the primitive eye patch. The visual apparatus has definite areas or centers in the cortex. It appears, however, that these areas are dormant at birth and become developed after birth, by habit and experience. It may be that both of these preliminary attributes are dependent, in some measure, upon a third element. It may be that there exists a subconscious pattern of development which becomes manifested when the visual faculty is being developed, mentally, at least. This "subconscious pattern of development" may be an inborn faculty which may be part of the individual's makeup. He probably follows that "pattern" in the course of his development, possibly, for all the faculties in which there is a secondary learning process necessary for their conditioning or acquirement. It may be, then, that this third element is the "subconscious pattern of development," a sort of blue-print which the individual's mind calls to its aid when the dormancy of the visual habit is being broken down during the process of "learning" how to see. Physiology and psychology may frown upon the explanation herewith given, but what other means have we to explain the manifestations of strabismus or heterophorias produced in some ametropic patients who happen to have certain systemic disturbances and the absence of such muscular debilities under similar conditions in other patients?

Essentially, we are concerned with the clinical variety of muscular anomaly. The orthoptist in his office and clinic is confronted with one vital question—WHY? The anxious mother is not interested in the hair splitting technicalities of the theorist, or in the diversity of opinion on the subject. She is interested in only one question, and that is, "Can anything be done?" Subconsciously, perhaps, that mother would like to know why her child developed strabismus after an attack of whooping cough, while the child next door who also had the same sickness, came out of it with perfectly straight eyes.

Refractive conditions, especially anisometropias, are regarded as predisposing etiological factors in strabismus. It is a common observation clinically, that one eye in the strabismus patient is decidedly different, refractively, than the other. It is noticed, moreover, that it is the eye with the greater refractive error that is usually deviating. This phenomenon may be explained by the difference in the size and shape of the retinal images, as being responsible for the failure at fusion, hence the deviation. Optometrists, however, are very apt to come across cases of anisometropia in which similar clinical manifestations are apparent and yet there is orthophoria, or a slight heterophoria, but no strabismus. What explanation have we for these phenomena? Why does anisometropia induce strabismus in some cases and not in others?

Anisometropia is only one part of the picture. The same manifestation may be observed in cases in which there is no refractive error. Nor it is not uncommon to find convergent strabismus in myopes and divergent strabismus in hyperopes and vertical deviations in both. Alternating strabismus may be observed in any of the conditions mentioned. What is the cause? What is the explanation?

What can be the explanation for the following case? The patient is apparently an emmetrope. His chief complaint is asthenopia. There is no evidence of fundus pathology and all the reflexes and external eyes are normal. Objectively and subjectively he accepts O.U. + .37 sphere. There is no reduction in his visual acuity with, or without, this correction, which is 20/20 in each eye. His convergence near point is at 18 inches. Nearer than this point there is exophoria. This is apparent with and without the correction. The patient has several pair of glasses, prescribed by reputable refractionists, optometrists and medical. The glasses range O.U. +37 sphere=2°, 3°, 4° base-in prism O.U., respectively. The last refractionist advised operation. The case history is that the patient (now 19 years old), was left-handed since infancy and that at about six years of age, he was made right-handed, by force. He and his parents recall that he has had eye trouble since about that time.

This case is not an exception and is typical of many cases of similar nature for which there is no plausible explanation. Why this boy became heretophoric and is becoming progressingly worse, while another lad of the same age and under the same circumstances became a stutterer, is a question which needs elucidation.

It may be that the secret lies in the suggestion made earlier in this paper that there is a *"Subconscious pattern of development"* to which the individual turns whenever there is confusion in the normal development of an acquired, or learned faculty. This "subconscious pattern" reaches into the "experiences of the remote past" and takes as its own, the particular pattern which it is lacking. It seems to be common belief that there is a predisposition to strabismus and it is more or less definitely established that strabismus is inherited. These two beliefs can be added into one and a statement made that the *"Predisposition is usually among those who have the inheritance tendency to strabismus."* This statement possibly sums up and clarifies the contentions presented with regards to the manifestation of muscular imbalances and now I shall attempt to suggest a possible cause for the condition under discussion.

Clinical and empirical observation of a large group of strabismus cases led me to the conclusion that this anomaly is produced as the result of the arrested development of the visual pathway and the visual reflex arc. The contributing factors may be either exogenous or endogenous, or both. The condition, as already observed, usually occurs in predisposed individuals and there appears to be an inheritance tendency to strabismus, either within the immediate family, or remotely. The binocular function

development is interrupted by some systemic, neurological, emotional or endocrine disturbance. There is temporary cessation in the development and acquirement of the various rudiments which constitute the function of binocular vision, such as co-ordination, fusion, and stereopsis. The presence of ametropia seems to help in the acquirement of strabismus, although it does not seem to be the essentially contributing factor in the etiology of strabismus. This can be gathered from the observations which nearly all orthoptists can make. Not all ametropic patients have strabismus and this applies to cases of latent errors as well as manifest, and to cases in which the tonicities indicate very high readings. The presence of ametropia may complicate the condition further by disrupting the accommodation-convergence relationship. By itself, however, ametropia is not the primary etiological factor in the appearance of a muscular defect. The indication is that there are additional contributing factors present, which, together with the existing ametropia, may induce a muscular defect.

The question then arises "What is meant by the *arrested development of the visual reflex arc and the visual pathway?*" This can best be answered by giving a brief review of the physiology of the binocular vision apparatus.

Briefly, the apparatus of binocular vision may be described as a reflex arc made up of a centripetal path, a cerebral center and a centrifugal path.

The centripetal path is purely sensory. Muller has advanced the theory of corresponding retinal points which states "that there is a coupling of the retinal points in the right retina with corresponding retinal points in the left retina. The fovea and its immediate area have their own point of distinct conduction."

The individuality of the papillo-macular bundle is definitely established. It is definitely proven that the macular fibers form a distinct bundle of fibers in the optic nerve, with decussating and non-decussating fibers at the chiasm. There is, however, no absolute need for a rigorous anatomical coupling. Such a coupling may be only physiological and be quite sufficient. Starting from corresponding points in the two retinae, the images of the right eye and that of the left are propagated towards the cerebral center, and obviously, in order that the two images may be fused, the two paths must meet. At the very beginning of each optic tract fibres from one-half of the retina meet with the corresponding fibers of the other side, and a more perfect union of the corresponding fibres takes place in the ganglia at the base of the brain and what travels from there to the cerebral center, is really a resultant.

From the foregoing it is surmised that a clear pathway must exist for the conveyance of the external impulses which impign upon the retinae. The images are transmitted along the optic tract fibers to the

visual centers in the brain. Any interference along the path of conduction, whether it is mechanical, physical, psychic, or pathological, may upset the normal propagation of the impulses, with the result that there is confusion. In order to eliminate such confusion, suppression of the annoying impulses is resorted to, and this appears to be the pathological picture of amblyopia-ex-anopsia in its incipiency. There is apparently a sensation of visual confusion due to the existing diplopia (in some instances). By learning to suppress, the visual centers build up a defense against this constant interference. There becomes developed an area in which the troublesome images are ignored and then eliminated altogether. In time, a definite area which is known as a "Suppression area" becomes developed and the pathway of conductivity becomes affected. The visual centers in the brain learn to ignore the confusing images and gradually, it becomes apparent that an eye can forget how to see and yet remain open. Now, we shall take a concrete example in the form of an actual case, to further illustrate the point.

The patient is a child four years old. The eyes have been normal up to a year ago, when it had an attack of some febrile sickness. When the child recovered, the mother noticed that periodically, one of the eyes turned outward. The manifestation is that of periodic exotropia. An examination of the child's visual apparatus disclosed ametropia. Visual acuity is under 20/20 O.U. The fundi, pupillary reactions to light and accommodation, and the muscular versions and rotations are normal. The child is too young for an accurate perimetric examination. The opththalmic correction prescribed is quite ordinary. Visual acuity can be improved in the non-deviating eye, but the deviating eye cannot be improved to normal. There is definite indication of amblyopia ex-anopsia.

We know from the case history that the child had some febrile ailment in the course of which there was general debility of the muscles, in addition to greater tax on the vascular and nervous systems. In its effort to prevent more serious complications and possible death from the infection, all body energy is concentrated for the defensive action with the result that all other functional development activity is temporarily retarded.

Being considered an acquired or conditioned faculty, binocular vision may be learned improperly. The child has learned to use the visual apparatus, but it has learned it improperly. This may have been due to the abnormal interruption of the normal development during the crisis of the febrile sickness. The child learned to build own visual habits and it appears very likely that it followed a pattern with which it is subconsciously familiar. It is along such patterns that a child's mental faculty probably learns to shape and condition not only the visual habits and faculties, but also some of the other acquired functions. This may also explain the reason why the child in the case cited has acquired an exotropia, whereas another child under similar circumstances, might have

acquired some other physical defect. The explanation seems to substantiate the contention made that if the child's subconscious pattern of inheritance is one of orthophoria, the child will remain orthophoric (or nearly so) in the majority of cases, febrile sickness or other etiological factors notwithstanding. If the pattern is heterophoria or heterotropia, such conditions may follow when there is a contributing cause. This is rather common observation. Not all children suffering from febrile diseases, emotional upsets and other etiological factors develop strabismus, or high heterophorias, even if the attacks come prior to the sixth year. There may be noticed enfeeblement of the accommodation, or of the convergence, or an error of refraction may become manifested, but all these may become manifested without evidence of an actual strabismus. All this seems to point to the plausibility of the contention presented, and to enhance it.

In the preceding pages I defined orthoptics as being a "Psychologically Sound System of Eye Training Which Deals with the Correction and the Re-education of Faulty Visual Habits." In the observations that followed and which led to the introduction of the suggestion as to the possible cause of strabismus, I endeavored to prove that improper visual habits have been acquired and that the individual has accepted them as if they were real and normal. Psychologists tell us that it is possible to break old habits by acquiring new ones in their places. Reasoning on the strength of this assertion and knowing that vision is an "acquired habit," or a "conditioned reflex," it may be as possible to "learn" to see improperly. Further reasoning along this line, it appears that if it is possible to replace habits, and to re-educate the mental faculties to recognize and to accept new ones in place of those which have been known for long periods, it should be possible to include improperly acquired visual habits also. All that would be necessary is to teach proper visual perception, and to re-direct the flow of neural energy. Orthoptic training of strabismus, therefore, must emulate nature very closely. There must be a definite plan of procedure which applies to both, phoria and tropia orthoptics.

The plan of procedure in strabismus orthoptics consists of eleven steps. This number of steps constitute a definitely rounded-out technique for the correction of a case. Binocular vision is considered a conditioned reflex and its re-education must, as already pointed out, be along natural lines. Each one of these eleven steps is directed toward the reconditioning of the faulty visual habits. The repetition of some steps serves only to ingrain and to intensify the proper habit and to make it remain permanently. The technique is applicable to all types of concomitant strabismus cases. In the training of phorias only part of the entire program may be employed. In strabismus the entire eleven steps are indicated.

Outline of System in Orthoptic Procedure

In the training routine which I am about to outline, it will be observed that a comparatively greater part is devoted to the elimination of the amblyopia and all its complications. Only a small portion of the procedure is devoted to the training of binocular co-ordination. While it is recognized that binocular co-ordination doesn't depend on visual acuity, but upon the perceptive faculty of the higher visual centers, it is a recognized fact, nevertheless, that as long as there is suppression and the reflex arc of which binocular vision consists, remains obscured, binocular vision is not possible to attain. The elimination of suppression and with it, the development of visual acuity for both, near and distance, is the first and most essential step in the strabismus orthoptics procedure. Part of this training procedure is devoted to the development of orientation and visual perception. The length of time required for this part of the training procedure depends entirely upon the amount of visual loss and patient's ability to respond. I often spend as long as a whole year on this part of training and am not content to start training the binocular co-ordination function, as long as I suspect that there is possibility to raise the visual acuity. Some amblyopes lack even the most elementary function of visual perception, that of recognizing form and outline. This faculty should receive training even before any attempt is made to eliminate suppression. Any stereoscopic card, especially if colored, or one mounted on colored background, is useful for this training procedure. It is better than the visual acuity cards, inasmuch as it has objects which induce not only perception but also the apperception. Strangely, the amblyopic eye doesn't seem to benefit at all from the experiences of the other eye. It seems to remain an organ distinct and separate as if it didn't belong in the body. Stimulation for the elimination of suppression also includes macular fixation training and the training of projection. Visual acuity training at distance and near points, is a step consisting of the ones mentioned and additional procedures in the course of which the amblyopic eye is made to recognize and read measurable type of the Snellen variety. By this method of training, the quality and quantity of vision is developed and a record kept indicating the progress made.

Thus, the first part of the technique of Strabismus Orthoptics consists of:

1. The establishment of visual perception in the amblyopic eye.
2. The elimination of suppression.
3. Macular fixation development.
4. Projection training.

Monocular, binocular and simultaneous binocular fixation training may be started during the training of visual acuity. There are two stages in this training procedure:

5. Monocular and Binocular Fixation training.

6. Simultaneous Binocular Fixation training.

These two steps may be started during the training of visual acuity. This procedure tends to develop a feeling for binocularity and also tends to develop, what might be termed, equality in speed of perception. The training of simultaneous binocular perception often leads to the establishment of diplopia. If such a manifestation is not apparent, it may be necessary to induce diplopia artificially, by the use of ruby filters or with prisms. The reason why it is necessary to establish diplopia is two-fold. In the first place, it is the only positive sign that the suppression has been eliminated and that binocular perception is possible. In the second place, it is a positive indication to the patient that progress is being made. The patient should be explained the reason why diplopia is necessary, and why he should try to maintain it, in spite of the discomfort that it may produce. To suppress the diplopia is to induce suppression. The patient should be warned against this.

With diplopia established (this being step 7 in the training procedure) the patient is now ready for steps 8, 9, 10 and 11, which constitute the second part of the Strabismus training technique. These steps are:

8. Super-imposition training.
9. Duction training.
10. Fusion training.
11. Stereopsis training.

The sequence in which these four steps are given doesn't matter. It is, however, most beneficial to start with super-imposition training and to interpose fusion with duction as a diversion. Stereopsis should be induced at the earliest possible time, but its intensity can be developed as the last step. In the training of duction, fusion is also induced and when both are given in conjunction, there begins to be manifested a feeling for true stereopsis. Super-imposition training may enhance the diplopia and make it appear more intense. This is the reason why we advise instituting binocular co-ordination training simultaneously. Duction training is for the purpose of innervating the refractory muscles. The affected muscles are being innervated in their effort to align the images. By using dissimilar targets, greater lattitude may be attained in the ducting targets. By using similar design targets, fusion is taught. The amplitude of duction as well as of fusion may be further increased by the use of supplementary prisms. The muscle amplitudes are increased gradually until the easiest points of both are higher than the former manifested error. A ratio of 1 to 4 or 1 to 3 after relaxation seems best.

At this time the patient has developed a certain degree of stereopsis. This faculty, being the highest attainment of binocular vision, can be amplified and developed to a very high degree.

To summarize, the eleven steps are:

1. The establishment of visual perception in the amblyopic eye.
2. The elimination of suppression.
3. Macular fixation training.
4. Projection training.
5. Monocular and Binocular fixation training.
6. Simultaneous Binocular Fixation Training.
7. The Establishment of Diplopia.
8. Super-imposition Training.
9. Duction Training.
10. Fusion Training.
11. Stereopsis Training.

In phoria orthoptics, steps 8, 9, 10 and 11 are usually sufficient. Super-imposition training also serves to teach first degree fusion and the proper positioning of the images on corresponding retinal points. Furthermore, steps 8, 9, and 10 also tend to innervate the affected ocular muscles and further help to train co-ordination. Step 11 teaches stereopsis both qualitatively and quantitatively.

Alternating Strabismus calls for the entire eleven steps. The procedure depends on the individual case. For example, the alternator requires no training of the visual acuity, but he does require training of the visual perception faculty and the elimination of suppression.

The enigma which is Alternating Strabismus, seems to offer no plausible explanation for its occurrence. Worth attempted to explain it by his Fusion Theory, yet the theory which he propounded doesn't adequately explain the condition and the phenomena which are observed. Briefly, Worth contends that "The Total Absence of Fusion" is the cause for alternating Strabismus, and "Because of this congenital defect, fusion training of the essentially alternating strabismus is of no avail." This assertion is now disputed by Peter and others.

The contention "that there is a total absence of fusion" in alternating strabismus cases, is a clinical observation and is undisputed. However, there seem to be additional factors which, probably, are responsible for this "absence of fusion" phenomenon. The absence of fusion may only be a secondary manifestation and is induced by a primary defect in the mechanism where fusion normally takes place.

The retina as the receptive organ of the eye, conveys impressions impigned upon it, along the decussating and non-decussating optic nerve fibres and registers these impressions in the cortical areas known as the Primary Optic Centers, which are said to be in the External Geniculate Bodies. The macular fibres, being distinct and separate, undergo a partial decussation at the chiasm. In the left optic tract, therefore, fibres from four different regions are to be found: viz., the two-thirds of the temporal side of the left retina, the temporal half of the left macula, the

nasal third of the right retina, and the nasal half of the right macula. Corresponding fibres are to be found in the right optic tract.

The Primary Optic Centers may be termed the endings of the optic nerve proper. Here the retinal images are probably registered (although not unified) and identified. These centers are probably the first relay stations in the act of binocular vision.

From the Primary Optic Centers, the optic nerve fibres spread out into fan-shaped radiations, which terminate the occipital lobe of the brain. It is along these fan shaped optic radiations that the retinal image is probably conveyed for unification in the visual centers in the cortex.

It may be that the etiological factors in alternating strabismus is to be found partly in the elements which have to do with the conveyance of the retinal image from the optic nerve fibres to their termination in the occipital lobe. It may be that the lack of fusion, or its congenital absence is due to certain disturbing factors along the route of conduction. The seat of the disturbance may be in the primary optic centers and may occur as a lapse, or some form of aberration, or interruption at the junction of conductivity. The result is anomalous correspondence of the two images and inability of fusion. Alternating fixation and alternating suppression are clinical manifestations because of the distortions produced by the lapsing of the images. Apparently the images become assymetrical and out of relation to each other, causing them to appear dissimilar. Fusion is possible only when the two images are alike.

In alternating strabismus the visual acuity of the two eyes is usually about the same, and is generally quite good, and aside from possible fundus pathology, these eyes as a rule, present normal findings. The question arises as to the possible cause or causes for the defect. The indication is that there is no unification or fusion of the retinal images and that alternate fixation is a habitual manifestation. But the absence of fusion, seems, in itself, not to be the primary etiological factor. It may be a secondary manifestation, the primary one being located somewhere along the route of conduction. The binocular visual function as already mentioned, is a reflex arc consisting of a centripetal path, a cerebral center and a centrifugal path. Simply considered, this reflex arc is made up of afferent and efferent fibres with the brain center as the central point of conduction. The afferent fibres conduct the images toward the center and this is expressed by the centripetal path. The efferent fibres convey the impressions away from the center and is manifested by the centrifugal path. Improper conduction of the image along the afferent nerve fibres may produce the alleged lapse, and all the complications common in alternating strabismus.

Best results are obtainable in the treatment of alternating strabismus, when means are taken to establish a clear path of conduction. The establishment of binocular fixation is the most important step in the

training of alternating strabismus. The establishment of diplopia is the ultimate goal and is best attained when binocular and simultaneous fixation is definitely and consistently made part of the visual habit.

The remainder of the training procedure in alternating strabismus is similiar to that of other types of concomitant strabismus. Once diplopia becomes manifested, the re-education of fusion and the establishment of the normal binocular co-ordination is a matter of routine procedure. It may be more difficult in some cases than in others to establish binocularity and easy fusion, but with persistence and perseverence difficulties may be overcome and the case concluded satisfactorily.

In alternating strabismus types, two most puzzling and annoying manifestations may be encountered, which, if not recognized and eliminated, may spell failure. Aversion to fusion and Rapid Alternation are the two phenomena. Both can be eliminated by persistent and intelligent training. Aversion to fusion is manifested by the patient seeing the two images on their respective sides, but when super-imposition is attempted, the right sided picture may become displaced to the left and vice versa. This displacement occurs at the easiest point of superimposition and usually within the angle of the strabismus. There appears to be an area in which no fusion is tolerated. Rapid alternation is manifested during the fusion act. One image fades out for a fraction of a second, then it re-appears, only to have the image on the other side fade out, in a similar manner.

Analyzing the Case

Orthoptic cases require careful refractive and field examinations. The field studies should be both, central and peripheral. The fundi should be examined thoroughly; likewise the pupillary reflexes. Optical correction, if indicated, should be prescribed. A complete examination, whenever possible, of the accommodation, and the status of the extrinsic ocular muscles, should be made. In all cases, where suspicion warrants it, a thorough physical examination should be ordered. The fusion faculty should be studied whenever possible. It is imperative to determine if there is retinal correspondence, both by the after-image test and on the tangent scale. All findings should be recorded and made part of the orthoptic record.

When all the data is compiled, a program of training should be prepared. In heterophorias, the technique may often be puzzling. Close study of the symptomotology and the various findings should make such cases easily treated. The treatment of strabismus depends largely on the external symptoms. The program in such cases should be arranged to allow training of all the visual functions involved, not only to a point bare improvement, but to a point of consistent retention of that improvement under varying conditions.

It is imperative that the orthoptist be familiar with the funda-

mental principles of orthoptics and that he be thoroughly versed in the various routines and techniques. Understanding of the elements of Psychology, especially Habit, Attention and Perception, is of utmost value. The orthoptist should be well versed in ophthalmic neuro-myology anatomy and physiology. He should be familiar with the various structures in the head and their anatomical, physiological and pathological relations to the eye.

The practice of orthoptics is daily becoming more important in the field of ophthalmic practice, and it is for this reason that it can not be permitted to be practiced by "rule-of-the-thumb." There is considerable material, both clinical and theoretical, on the subject, which, together with actual clinical experience, indicate that successful results are possible by the re-educative method of Strabismus training.

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SECONDARY DEVIATION OF THE VISUAL AXIS AS THE PRIMARY DIAGNOSTIC POINT BETWEEN PARALYTIC SQUINT AND CONCOMITANT SQUINT

Strabismus or squint is a not uncommon condition met with in the practice of optometry. Refractionists are frequently called upon to correct this condition and in making their diagnosis it is necessary of course to first determine the cause of the condition. If the squint is associated with an error of refraction and if no paralysis of any one of the extraocular muscles is present the squint is concomitant and there may be some hope of improving the involvement by means of various orthoptic procedures. If, on the other hand, the squint is caused by a paralysis of one or more of the extraocular muscles, orthoptic treatments will do but little. It is therefore necessary to understand fully the differential diagnostic tests to be made in these cases of squint so as to make a diagnosis of value and to also enable the optometrist to make a prognosis which will later on be substanciated.

It must be understood first that when one of the muscles attached to the globe of an eye is paralyzed, strabismus or squint usually results. Next, when this happens, the patient as a rule suffers from diplopia, some nausea and frequently dizziness. These patients as a rule report im-

mediate relief when covering one eye, particularly when they cover the eye associated with the paralyzed extraocular muscle. And last, it can be determined that in these cases in which there is a paralysis of one of the extraocular muscles the secondary deviation of the non-affected eye, in these cases is seen to be greater than the primary deviation.

This last point is the important differential diagnostic indication in making a diagnosis of paralytic squint as this secondary deviation occurs only in these cases. To illustrate this, we will take for example a case in which there is a paralysis of the left external rectus. To make the test to determine whether or not the secondary deviation is greater than the primary, one covers the patient's right eye with a lens the lower half of which consists of ground glass. Movements of the eye can therefore be observed by the examiner through the upper half of the lens, but the patient cannot see the fixation object which is held in front of the patient slightly below the patient's eyes. The left eye remains uncovered. Next the fixation object is moved slowly to the patient's left, the patient being at the same time requested to follow the movement of the fixation object with the eyes only. It will of course be noted at once that the left eye will not cross the center line, but it will in these cases of paralytic squint, also be noted that the right eye will be turned strongly towards the inner canthus, into such a position that if its visual axis were prolonged outwards it would pass the fixation object on its left side.

The reason for this phenomenon or diagnostic syndrome is easy to understand. When the fixation object is moved to the left the patient attempts to move the left eye outward and this effort requires such a considerable amount of nervous innervation to be imparted to the paralyzed muscle (the left external rectus) that the accompanying innervation sent to its associated muscle (the right internal rectus) is greatly in excess of the natural amount required, and the patient's right eye is therefore turned too far inwards, or in other words the secondary deviation is in excess of the normal deviation. It must also be understood that in those cases of concomitant squint the primary deviation and the secondary deviation will be found to be equal.

Carel C. Koch

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SPECIAL REPORTS

OSTEOPATHY AND THE EYE*

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What is osteopathy? Osteopathy is a new view of the human body from the standpoint of health and disease. The human body was viewed

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osteopathically as a mechanism and an organism. Mechanically it represented all the physical principles that were found in Nature. Organically it represented the vitality and all the living characteristics of the human body as they found it today.

The fundamental principles of osteopathy were classified under three heads. First of all, Nature had developed within the body, and had the power of developing, all the remedies that were necessary for the cure of disease. That was a big proposition. This was the reaction to drugs, as they were commonly called, as they had been used traditionally in the healing art. Dr. Still was forced to this by conditions which developed in his own family. There was an epidemic of cerebrospinal meningitis through which he lost two sons. The third was almost lost when Dr. Still realized that he had the power in his hands which could cure the meningitis, and he did. He found a condition in the neck that was disturbing the circulation to the brain and spinal cord; he corrected that and his son's life was spared. That son joined with him as the vice-president of the American School of Osteopathy. That was the family position which forced Dr. Still to question the valuability of the use of drugs in dealing with disease and forced him to the use of his hands in an attempt to cure conditions of the human body which arose from the circulation and the nerve force, and give the body its natural power to create all the remedies which the body required. This had been questioned from time to time by medical doctors all over the country, but the answer to it was this: Experience. He was a medical doctor himself, he had been a medical doctor for thirty-five years and he had not used medicines except as antidotes for poison, antiseptics and anaesthetics.

If the body has its own laboratory within it, consisting as they all knew of the secretory glands which were functioning everywhere in the body, what was the function of these secretory glands? To prepare the different substances which the body needed for its healing. He could give an illustration with regard to the eye along those very lines. He had a patient recently who had been in hospital getting injections on a thyroid basis for trouble in the eyes. She was practically totally blind and when she came to him her eyes were covered with black glasses and she had to be led around. He examined her very carefully; corrected a condition in the neck and in the lower part of the spine. Three days later she came in without the black glasses and said "I can see!" Her eyes were open and steady. She has been steadily progressing and has the use of her vision which she had not had before. He had rectified the circulation of the blood and nerve force and directed it towards the eyes and they responded.

That was a concrete illustration of the first principle. If the body is a mechanism and an organism which has this power resident within it, the second point which Dr. Still laid down was: the body must be, from the standpoint of its framework and of its functioning in perfect

order. It is this order and this organization in the structural part of the body, in the correlation of these parts that is the foundation on which both health and disease were built, and that was their fundamental theory in regard to what they called lesions. They went over the entire body, they centered their ideas upon the spinal cord and the spinal column because that was the central point in the distribution of the nerve supply and the control of the blood supply to every part of the body.

When a patient came to them their diagnosis was based upon the fact that at a certain point in the spinal column they found a deviation from the normal, or they found a deviation in a rib, or they even went into the internal organization of the body. The internal organs of the body were all in three cavities, the skull, the thorax and the abdomen, and all the organs occupied a definite position. Not only did they occupy a definite position if normal, they occupied that place in a definite relation to the pressure in that cavity. Every muscle, every organ of the body had its own rhythm, they knew that from the heart.

Osteopathy carried out that same principle and applied it to every part of the human body, even the eye. The accommodation of the eye was the great central idea that lay at the foundation of refraction. They said that accommodation in the eye was not only governed by and dependent upon the lens and its relation to the ciliary muscle, but it was also dependent on and regulated and controlled by all the external muscles that were attached to the eyeball. That was the foundation of the rhythm of the eye, just as they had the rhythm of the heart. Their great idea in dealing with different conditions was to so regulate that rhythm by the correction of the different muscles and structures in the eye that the eye would be normal in structure and function and then it would refract in the proper way in relation to light or any other stimulus.

The optometrist's principle was visual, whereas the osteopath's was physical. Osteopathy said that if the human body was normal as a mechanism, all its structures must be normal in their structural conditions, in their rhythmic conditions, in their correlation with each other, in their relation to the cavity in which they are located and their relation to the central nervous system and the sympathetic nervous system; and their work, as osteopaths, was to correct the lesion and allow the body to get back to its normal structural integrity, so that it may operate in the perfect way it was intended to operate.

The eye was just one little organ in the great field of the body and they were interested in it from that standpoint and they accepted and adopted all that was argued from the standpoint of the ophthalmic optometrist in trying to rectify the refractive conditions of the eye.

The third proposition laid down by Dr. Still as the foundation of osteopathy was: that the body as a mechanism, anatomically, physically

and physiologically perfect, had the power to preserve its own immunity from disease. The meaning of that was this. The body had an anatomical system, it had physical characteristics, it had physiological functions, and all these co-operated together to make the body the perfect organism which it was intended to be, and that was the foundation of their principle laid down with regard to the human body.

The companion and researcher who worked for years with the discoverer of insulin ultimately became an osteopath, and for four or five years taught pathology in the American School of Osteopathy. If they wanted an independent judgment of what osteopathy was and how it operated, the book of M. A. Lane on Osteopathy would tell them. He was a medical man, a researcher, pathologist and bacteriologist, and he came down, as some thought, from the heights and adopted osteopathy because of its scientific accuracy and the scientific foundation upon which it was built. That was the reason why for so many years he himself had stuck to osteopathy and he had treated every conceivable type of disease, even the acute diseases in their virulent forms. These acute diseases, some doctors told them, osteopathy could not treat because the treatment would be too violent. A young girl had influenza in 1918 when there was the terrible epidemic. She was attended by a medical practitioner. After the influenza she had double pneumonia. He was summoned one night with the news that she could not survive until morning. He went to her and he gave her osteopathic treatment. He relaxed the spine, lessened the respiration, reduced the temperature by inhibition in the neck, and about twelve o'clock that night she rallied and is still alive today. That was what could be done by simply rectifying the conditions that were astray and wrong in the body. This was just what optometrists did to the eye. He had been through their clinics downstairs and he had seen all the instruments in active operation. They were mechanically testing the eye because their fingers could not do it. They were testing the eye from the physical standpoint, they rectified the eyes by the use of glasses. He rectified the body by means of his fingers. He made the body go back to the use of its own functional powers as these were designed to be used by the living human body. With regard to the eye. He was not going to try and teach them anatomy and physiology, because they all understood the functions and structure of the eye, but he wanted to tell them that from his standpoint, accommodation was controlled by the third cranial nerve, which regulated all the muscles in the eye with the exception of the superior oblique muscle, which was regulated by the fourth cranial nerve, so that they had the second, third and fourth cranial nerves coming into active operation in connection with all that there was in the functioning of the eye.

The question arises: How did this operate? In the first place, it operated by the normal action of all the different structures which make up the eye. The final control of what is called the rhythm of the eye

took place by the co-ordinated action of the ciliary muscle and of the external muscles, attached externally to the eyeball. When the eye became abnormal what happened? Speaking osteopathically, the abnormal action took place by an abnormal action of the external muscles, and this abnormal action of the external muscles caused inco-ordination with the result that the eye was strained.

That was the first stage. In the second stage, every refractive error, in the eye, produced from this standpoint, reacted upon the eye, producing eyestrain, circulatory strain, nerve strain, and these reacted upon the entire body. He was not going into the subject of Iridiagnosis, but Iridiagnosis was a part of osteopathy originally many years ago. It had been developed since in Germany, in the United States and in this country on an independent basis so far as osteopathy was concerned, but it was a part of the osteopathic system. What did it demonstrate? The iris of the eye was simply a diaphragm upon which was exhibited a picture of anything and everything going on in the body.

How did it take place? It took place from the fact that the third and fourth, together with the second cranial nerve and also the fifth and sixth cranial nerves and the seventh cranial nerve were all associated through the cranial field at the base of the brain and in the spinal cord with every part of the human body, and here they discovered the basic principles of ophthalmology. He could tell them of cases which had been cured from this standpoint. One case dealt with by osteopathy was the case of a student who was injured on the football field. As a result of his injury he became totally blind and he had to give up his study. Somebody told him of osteopathy. His sight was restored and he started to study osteopathy. He was for years one of the most brilliant research workers in the field of osteopathy. Correction of the nerve supply, correction of the blood circulation to the eye restored the vision.

Many of them had heard of Signaller Skeyhill, the blind poet. He was blinded at Gallipoli during the war, by a violent explosion. He tried all medical means in this country, in Europe, Australia and America. The regular doctors said his case was one of shell shock and hopeless. Osteopathy cured him. Here is an extract from a letter which he wrote: "Within a few minutes after the doctor (D.O.) began manipulating and adjusting the back of my neck at the apex of the spinal column, I experienced a sharp, excruciating pain. Then as if by magic little flashes of light came before my eyes and I found that I could see. I say this because of my constant gratitude and ever-growing appreciation of what osteopathy is and does." That illustrates the point that the correction of the irritating condition that lay back of the trouble in the eye may be in another part of the body. The eye would respond, become rhythmic and renew its functional activity.

All the organs of the body were rhythmic. The eye was rhythmic also. How did it get and maintain its rhythmic characteristics? From

the co-ordinated action of all its muscles. That was what osteopaths set themselves to do when they treated these cases. First of all they tried to find out the cause and iridiagnosis might help them because by their examination of the iris they could find colored spots and lines in different sections of it, and they could carry them to the field from which the irritation was coming towards the eye.

When they located that field, then they centralized on the spinal point that corresponded with the field of irritation and when they had corrected that central point then they went back to the eye. What did they do with the eye? They did with the eye what they would do with any other organ. They treated it with their fingers. They manipulate, the idea being to establish free circulation, free drainage and to stretch the various muscles and get them back to co-operative action. Osteopaths first of all corrected the anatomy and physiology of the body and then they used the exercises. The idea of exercises was to make them functionally active. That was one of the great theories of osteopathy, exercise and activity.

One thing that was very much emphasized by the medical profession was rest. Osteopathy took the opposite view. The body is a mobile structure. It was intended to be a mobile structure and if they suspended that mobility they would create the conditions associated with whatever diseased condition there might be. Take arthritis. There were more cases of arthritis produced by rest than by any other cause. People got rheumatism and they would not move the affected part. What was the result? Circulation was cut off, drainage was cut off, the nerve supply was obliterated or partly obliterated so that it did not function.

They applied the same principle to the eye and that was the function of these eye exercises after they had corrected the lesions as they found them. The basis of the osteopathic idea of all types of disease, including the eye, was normal structural integrity. Free circulation, free drainage and a free nerve supply were the foundations of the control of all the mobile activities in the eye, in the stomach, in the heart and anywhere else throughout the entire body. If perfect vision depended upon the power of accommodation and if that power were regulated by the nerves as indicated, and if the vision depended upon correlation of all the muscles in their various attachments and relations to the eye, then their idea was that they set themselves to correct these conditions and to use that correction as a means of bringing back the eye to its normal structural state of integrity. That brought up the question of whether osteopathy could not use the optometrist—if they would forgive him putting it in that way. Osteopathy could use the optometrist and they were only too pleased and glad to feel that they could co-operate with the optometrist in an attempt to establish correct vision. Optometrists were attempting to correct the vision from the standpoint of

refraction, they were doing that corrective work and keeping track of it, just as osteopaths were correcting the anatomical and physiological conditions of the body.

He thought, if he might make a suggestion to them, that they might change the glasses from time to time until they were using glasses as osteopaths used their hands, to try and correct the eye. In that respect he might say that the optometrist had been serviceable in many cases. One of the first cases which he treated after the war was that of an officer who was almost blinded. He did not entirely lose his sight, but he was practically blind, and everybody else said that he would never recover his vision because it was due to an explosion. He (the speaker) never took that view. He thought it was due to shock and strain. He sent that man to an optometrist and had a thorough examination of the eye made. He took that as a part of his diagnostic examination and he proceeded to correct the eye in relation to the spine. What was the result? His glasses were changed many times in two years and osteopathic treatment continued for correction and at the end of the time he could dispense with both glasses and osteopathy. They were working in common to restore the active power of the eye and to lay the foundation for the restoration of sight. Their field of work went far beyond that in relation to the eye, although optometrists were not specially interested in that part of the work. One of the most celebrated cases he had treated was the wife of an attorney. She came with a diagnosis of developing cataract. All that the ophthalmologist said was "Go and wait until the cataract ripens and then we will operate." He treated these eyes from the osteopathic standpoint and as they were being corrected he had them optically examined and glasses provided so that she could make use of her eyes. They knew how it was with a cataract patient. They could be given a greater range of vision by glasses. By the conjoint action of the optometrist and the osteopath that lady received her sight back again, and thirteen years afterwards she had still perfect vision. There was never any return of the cataract condition.

He was only saying that he dealt with the cataract in the developing stage. The same thing was true in any disease. If they had a terminal condition it was incurable by osteopathy or anything else. They only claimed to rectify the integrity of the function of the body and to rectify the structural activity of the body that was in normal condition. He thought he had given them in outline the idea that they had in mind. They might ask what is a lesion? He knew it from his dissection of the human body and from what was better the examination with the fingers by tactility. The tactility of the fingers would give them the keynote of the relation of every structure in every part of the body. They went over the entire body and they found out where the deviations from normal were. They would find tender parts. In this they were carrying out physiological laws. This gave them the power to diagnose con-

ditions that were varying from the normal. When they found these variations they corrected them and that was the correction of the lesion.

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BOOK NOTICES

NEURO-OPHTHALMOLOGY. R. Lindsay Rea, B.Sc., M.D., F.R. C.S. Ophthalmic Surgeon to West End Hospital for Nervous Diseases, London, etc., etc. Published by the C. V. Mosby Company, 3525 Pine Blvd., St. Louis, Mo. 568 pages. Illustrated. Cloth $9. 1938

Rea brings a new approach to the literature of ophthalmology. In his text just completed he reviews the entire subject of ocular pathology, refractive symptoms and imballances of the extraocular muscles from the standpoint of the neurologist rather than from the standpoint of the ophthalmologist or the optometrist. As a neurologist having a strong bent for ocular matters his views are therefore of some importance and his present presentation is one which every eye man can read with profit. His chapters on refraction will, to be sure, be of little value to the optometrist, but the greatest part of this new work deals with the neuro-ocular aspect of symptoms and the broadened outlook presented by this English writer is something which is both stimulating and refreshing. Rea has performed a service of no little merit in his attempt to bridge a gap as important as this, and by so doing has added much to the literature in this neglected but very important field. The work carries a very large bibliography.

C. C. K.

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PAGE HEADINGS

The reason offered for using "drops"—Lack of controlled experimentation—Statements favoring the use of "drops"—The other side of the question—Statements opposing the use of "drops"—Dilation adds to difficulties—Oculists disagree on use of "drops"—A controlled investigation of the matter—How the idea of using "drops" started—Findings variable with different drugs—Controlled experiments by Tait—Variable results obtained when "drops" are used—Findings with "drops" of questionable value—Summary—"drops" should not be used—Optometric techniques require no "drops"—Clinical evidence against the use of "drops"—Refraction with "drops" mere guesswork—"Drops" are undependable—"Drops" are unnecessary and inaccurate—Danger and inconvenience of using "drops"—"Drops" shown to be unnecessary.